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DRAWINGS ATTACHED

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(54) CALCULATOR INSTRUMENT

(71) We, MAY & BAKER LIMITED, a British Company of Dagenham, Essex, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to calculators.

In the photographic industry, the processing of film is frequently effected in processing machines, in which the film is conveyed by mechanical means sucessively through baths of photographic developer and fixer solutions, optionally with intermediate or subsequent washing. Hardening agents may be incorporated in these baths or the film passed through a separate bath of hardening solution. A serious problem encountered in the processing of photographic film in this manner is the deterioration of the processing baths, for example owing to the exhaustion or oxidation of active ingredients in the baths. This problem is found particularly with the developer baths and it is, therefore, necessary to monitor the photographic efficiency of developer baths at frequent intervals to ensure consistent performance of the processing system. It is, therefore, customary to test the developer solutions periodically and it is often found necessary, as a result of deterioration, to add precisely calculated quantities of chemical components of the developer solution, in the form of replenisher solution, to counteract any deterioration and restore the developer solution to its original effectiveness. It is normal practice to carry out tests to detect deterioration of developer solutions with strips of photographic film which have been pre-exposed, under controlled conditions, to a range of light exposures. Film strips which have been produced in this manner are passed through the processing machine operating under conditions of time and temperature identical to those used for production work. The visible photographic image that results from such processing treatment displays the levels of optical clarity that are achieved with the chemical system for the given range of light exposures.

The optical density values of the processed strips are measured with a densitometer and these values are graphically plotted against the value of the light exposure given. The resulting characteristic curve is interpreted by calculation of two parameters namely gradient and effective developer speed which are utilized as a measure of the condition of the developer solution. A record is kept of the test values and when this record indicates that replenishment is necessary a certain measured quantity of replenisher is introduced into the processing bath. It will be appreciated that this is a time consuming operation, particularly the steps of drawing of the graph and subsequent calculations.

It is now proposed, according to the invention, to provide a calculator instrument for use in calculating the deterioration of photographic film processing baths, such instrument comprising first and second relatively movable parts, a cursor movable with respect to said first and second parts, a first scale on said first part indicating values of effective developer speed, a second scale on said first movable part indicating a printed scale value to be read of a processing control strip used to test the film processing bath, a third scale on the second movable part again indicating said printed scale value, but being marked in the reverse sense to that of the second scale and a fourth scale on the second movable part indicating contrast gradient.

The instrument may, for example, be a linear or a cylindrically operating instrument, such as is conventional with slide rules, or preferably it is similar to a circular slide rule, having a fixed outer disc member, a coaxial rotatable inner disc member, and a cursor overlying the scales of both the inner and the outer member, and coaxially rotatable relative thereto.

With such a construction, the inner member preferably has a scalloped edge is formed

of a transparent plastics material and carries underneath the transparent plastics material the first and second scales, while the third scale is on the outer member, immediately radially outwardly of the second scale. By providing a scalloped edge to the inner member which extends radially beyond the third scale, wear of the third and fourth scales are substantially reduced.

The invention also provides a method of testing a photographic processing bath, comprising processing through said bath a strip of photographic film having a printed scale value thereon and upon which is pre-exposed a continuous range of light exposures in the form of a thin ribbon, measuring the optical density of the strip by means of a densitometer, marking particular values of optical density on the strip, determining the corresponding printed scale values and using the instrument according to the invention to calculate the contrast gradient and effective developer speed of the bath.

In order that the invention may more readily be understood, the following description is given, merely by way of example, of a calculator suitable for use in the processing of lithographic line and halftone films and its use in such processes. Reference is made to the accompanying drawings, in which:—

Figure 1 is a top plan view of one embodiment of calculator instrument according to the invention; and

Figure 2 illustrates a processing control strip.

As has been indicated earlier, during the processing of a photographic film the developer solution suffers some deterioration. The processing control strip 10 illustrated in Figure 2 comprises a strip of photographic film upon which is pre-exposed a continuous range of light exposures in the form of a thin ribbon 11 extending along a large portion of the length of the strip. The processing control strip is processed in the machine so that the developer produces a visible photographic image such that the portion at the left hand side, as seen in Figure 2, exhibits high density, the result of receiving 500 × more light exposure than the portion at the right hand end, which has scarcely any density at all. A constant variation in exposure has therefore produced a density variation throughout the length of the ribbon. Also marked on the strip 10 is a printed scale 12, which is an inverted scale of the value of exposure given to the strip.

Turning now to Figure 1, there is illustrated a calculator according to the invention. This comprises a stationary outer member 13, which may be secured to a stiff card, a rotatable transparent inner member 14, and a transparent cursor 15. The inner member 14 and cursor 15 are rotatable about the central axis 16, which is formed by a screw threaded rod provided with a nut 17 to hold the cursor and inner member in place.

The outer periphery of the inner member 14 is scalloped as illustrated in the Figure.

Secured to the undersurface of the member 14 is a circular sheet of paper including a first inner circular scale 18, and a second or outer circular scale 19. The inner scale indicates, in logarithmic fashion, the effective developer speed which is to be calculated while the outer scale 19 indicates the printed scale value as indicated on the printed scale 12 of the processing control strip 10. Also marked on the sheet of paper carrying the scales 18 and 19 are a reference arrow 20 and an identification arrow 21; for ease of identity these arrows may be coloured, for example, arrow 20 may be red and arrow 21 green.

The stationary member 13 includes a third scale 22, and an outer or fourth scale 23. The third scale is again identified by a coloured, e.g. yellow, arrow 24.

As can be seen from the drawing the scalloped edge of the inner member 14 just overlies the scale 22 so that, upon rotation of the inner member, the fingers and thumb of a user do not scrape the third scale 22, and also lie within the fourth scale 23. It will be noted that the second and third scales 19 and 22 have identical gradations, but are numbered in the opposite sense.

In use, the strip is processed through the chemical system under the same conditions as are used for production work and becomes developed to a density varying along the length of the ribbon 11. The optical density of the strip is then measured by densitometer, and those parts which have a nett optical density of 0.30 and 3.30 are marked as indicated at 29 and 30 and the corresponding printed scale values are noted. The red pointer 20 is then set at a printed scale value density 0.30 on the scale 22 indicated by the arrow 24.

The cursor 15 is then set so that its line 31 corresponds to a printed scale value for a density of 3.30 on the scale 19 indicated by the arrow 21.

The "lithographic or contrast gradient" and "effective developer speed" values are indicated by the cursor on the fourth scale 23 and on the first scale 18 respectively. These values are entered on a log sheet indicated and if a change takes place beyond the determined values, a measured quantity of replenisher is poured into the tank.

The calculator of the invention has been described in a form as suitable for use with a chemical system used for the preparation of lithographic line and halftone films. By suitable changing of the calibration of the outer scale 23 the instrument could equally

be used for calculations concerned with the radiographic and general photographic field of film processing, in which the control parameters are different.

WHAT WE CLAIM IS:—

1. A calculator instrument for use in calculating the deterioration of photographic film processing baths, such instrument comprising first and second relatively movable parts, a cursor movable with respect to said first and second parts, a first scale on said first part indicating values of effective developer speed, a second scale on said first movable part indicating a printed scale value to be read of a processing control strip used to test the film processing bath, a third scale on the second movable part again indicating said printed scale value, but being marked in the reverse sense to that of the second scale and a fourth scale on the second movable part indicating contrast gradient.

2. An instrument according to claim 1, wherein the first and second movable parts and cursor are arranged in the form of a linear slide rule.

3. An instrument according to claim 1, wherein the first and second movable parts and cursor are arranged in the form of a cylindrical slide rule.

4. An instrument according to claim 1, wherein the first and second movable parts and cursor are arranged in the form of a circular slide rule, having a fixed outer disc member, a coaxial rotatable inner disc member, and a cursor overlying the scales of both the inner and outer member, and coaxially rotatable relative thereto.

5. An instrument according to claim 4, wherein the inner member has a scalloped edge and is formed of a transparent plastics material and carries, underneath the transparent plastics material, the first and second scales, the third scale being on the outer member, immediately radially outwardly of the second scale.

6. A calculating instrument substantially as hereinbefore described with reference to and as illustrated in Figure 1 of the accompanying drawings.

7. A method of testing a photographic processing bath comprising processing through said bath a strip of photographic film having a printed scale value thereon and upon which is pre-exposed a continuous range of light exposures in the form of a thin ribbon, measuring the optical density of the strip by means of a densitometer, marking particular values of optical density on the strip, determining the corresponding printed scale values and using the instrument according to any one of the preceding claims to calculate the contrast gradient and effective developer speed of the bath.

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1 SHEET This drawing is a reproduction of the Original on a reduced scale

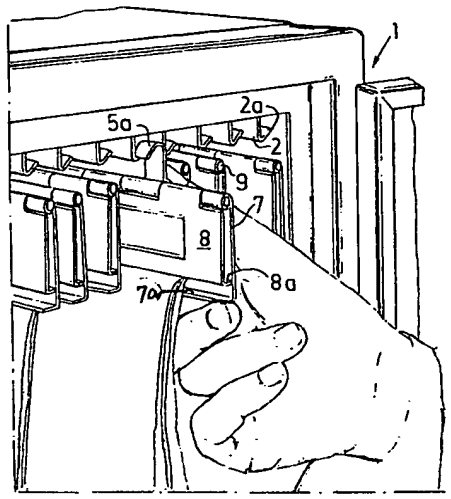

FIG.1

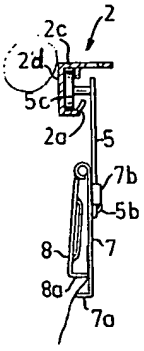

FIG.3

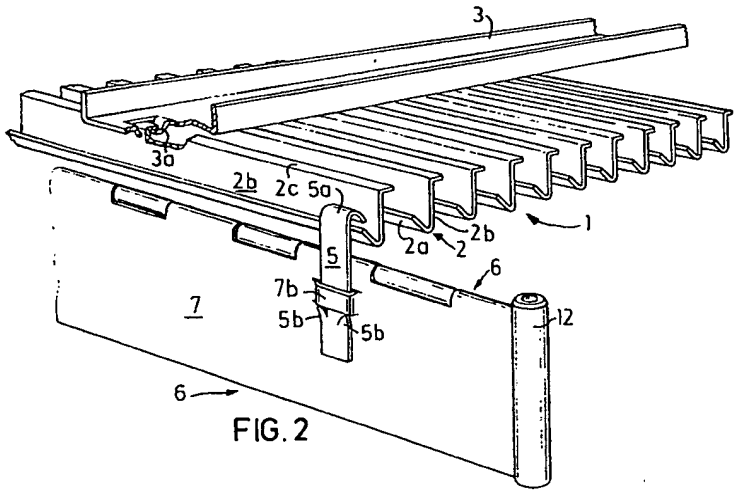

FIG.2